I. Project Title: Colorado River Embeddedness Monitoring Study

II. Principal Investigator(s):

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III. Project Summary:

A program designed to monitor embeddedness of gravel and cobble substrates in the upper Colorado River was initiated in 1999 continued in 2000. Baseline embeddedness data wwere previously collected during 1996-1998 as part of another study. This monitoring program will be used to determine effects of various flow regimes on substrate condition. Substrate composition affects primary and secondary production in riverine ecosystems. Periphyton and invertebrates, the food base of the fish community, depend on rock surfaces for attachment sites; in addition, invertebrates depend on the interstitial voids among rocks for shelter and feeding sites. Because the transport, sorting and deposition of coarse and fine-grained sediments is largely determined by the flow regime, gaining a better understanding of the link between streamflow, substrate characteristics, and food availability will allow managers to more effectively manipulate flows to maintain and enhance native fish habitat.

Monitoring was conducted in two reaches of the Colorado River in the Grand Valley, near Grand Junction; this area includes the highest concentrations of Colorado pikeminnow in the Colorado River. Monitoring sites in four riffles and four runs were sampled in the 15-mile reach, upstream of the Gunnison River confluence, and in four riffles and four runs in the 18-mile reach, immediately downstream of the Gunnison River confluence. At each site, 20 embeddedness measurements are made on each sampling date. Sampling was conducted once prior to runoff in early spring, and four times during base flows of summer-fall.

IV. Study Schedule: 1999-2009

V. Relationship to RIPRAP: Coordinated Reservoirs I.A.4.c(3)(c)

VI. Accomplishment of FY 2000 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Tasks

1) Sample 16 embeddedness monitoring sites in the Grand Valley on five dates. This task was accomplished on schedule.

Initial findings indicate that total depth-to-embeddedness (DTE) in riffles during base flow declined significantly from 1996 to 1997 and again from 1997 to 1998, leveled off from 1998 to 1999 and then continued to decline from 1999 to 2000. This was true in both the 15- and 18-mile reaches. For runs, total DTE steadily declined from 1997 to 2000 in both the 15- and 18-mile reaches. Peak flows during this period declined from 1997 through 1999 and the low 1999 levels were repeated in 2000. In the 15-mile reach, peak flows were: 1997, 26,500 cfs; in 1998, 14,400 cfs; in 1999, 12,700 cfs; in 2000, 14,000 cfs. In the 18-mile reach peak flows were: 1997, 36,800 cfs; in 1998, 24,700 cfs; in 1999, 17,200 cfs; in 2000, 17,000 cfs. Only in 1997 did the peak discharge exceed the threshold necessary for full mobilization of the bed. In the other years, thresholds were met that were necessary to initiate limited bed movement. The elevated base flow levels that occurred during 1999 may have been responsible for DTE in riffles having not declined between 1998 and 1999. Riffle DTE continued to decline again in 2000 probably because of a combination of low peak flows followed by low base flows. For runs, which constitute the majority of the habitat in the Grand Valley, peak flows that were capable of initiating limited bed movement but not full mobilization did not prevent sedimentation of cobble interstitial voids. The question of whether low DTE will level off at some point or whether rock spaces will continue to fill with low flow remains unanswered. So far, DTE has continued to decline: in the 18-mile reach relative DTE in both riffles and runs is now less than one median cobble diameter. This is also the case in runs of the 15-mile reach. To what extent invertebrate abundance has been negatively affected by this is difficult to determine without having had a concurrent invertebrate sampling program at the embeddedness sites. We hope to begin such monitoring next year.

VII. Recommendations:

Proceed with monitoring as before. Additional funding for concurrent invertebrate monitoring would allow better interpretation of biological implications of embeddedness.

VIII. Project Status: Project is ongoing and on-track. Field work is scheduled to continue through 2009 and report writing and completion in 2009.

IX. FY 2000 Budget Status:

A.	Funds Provided:	10,000
B.	Funds Expended:	10,000
C.	Difference:	0

X. Status of Data Submission: Not applicable. The database manager only requires submission of fish data.

XI. Signed: *Douglas Osmundson*, Fishery Biologist
11/27/00